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ABSTRACT

The possible uses of excess central processing unit capacity in an integrated academic library automation system discussed in this draft proposal include (1) in-house services such as word processing, electronic mail, management decision support using PERT/CPM techniques, and control of physical plant operation; (2) public services such as the support of reference activities through the development of online indexes and information files and the development of public access online catalogs; (3) network services, in particular participation in local library and information networks; and (4) entrepreneurial services such as the sale of computer time to academic departments. Included with the report are four figures illustrating possible computer system configurations, a 46-item reference list, and a supplemental bibliography. (Author/JL)

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# AFTER THE FALL: THE USE OF SURPLUS CAPACITY IN AN ACADEMIC LIBRARY AUTOMATION SYSTEM

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## Introduction

A trend currently surfacing in both print and practice is the concept of the "electronic" library. Since 1978, when Lancaster issued his call to arms on the subject (1), subsequent articles have explored the idea's dimensions. One author has discussed the concept in terms of networking; "The Electronic Library will exist at the state or regional level if the bibliographic resources of the area are regarded as a common resource . . ." (2) Another writer describes that library in terms of the expanded services, locally-based and otherwise, that a single library offers via electronic technology. (3) The trend also threatens to become bureaucratically entrenched; in March 1981 an American Library Association membership initiative group, the Electronic Library Association, was born in a meeting in Columbus, Ohio. (4)

This emerging library concept can be divided into a pair of broad elements, automation of internal library procedures and the application of various electronic technologies to the creation and improvement of services. For more than a decade the use of computers to automate such library functions as circulation and acquisitions has been underway, with varying degrees of success. In 1970 Allen Veaner noted, "The full scope of the problems of library automation is just beginning to be realized . . . We are beginning to define the problem; that is significant progress." (5) Veaner's observations are

equally valid in the current situation; "bugs" associated with automation are still surfacing. However, the overall problem continues to be refined as experience with automation increases and the technology continues to improve.

The second aspect of the "electronic" library trend is the use of current technology in areas and ways not traditionally associated with automation. The uses of word processing, mini- and microcomputers and video technology are being widely discussed in the professional literature and implemented in different types of libraries around the country. These developments raise some exciting possibilities about the future of library services.

The University of Alabama Library, Tuscaloosa, is beginning a project that may allow the synthesis of these two aspects of the "electronic" library. In the near future various functions such as circulation, acquisitions and cataloging will be automated. Once that process has been completed, the installed turnkey system will initially utilize an estimated fifty percent of the hardware's central processing unit capacity. (6) That percentage of excess will undoubedly decrease over time. Yet the hardware will have an initial two million bytes of CPU capacity, with another 400-600 m[illegible]n bytes of mass storage capability. (7) These amounts allow for speculation about possible uses of any excess capacity.

Such an Extended Library Automation System (ELAS) might include four basic areas of application: 1) in-house

services; 2) public services; 3) network services; and 4) entrepreneurial services. This paper will survey potential applications of the excess capacity in these areas. The current use of some technologies in real-life situations will be explored, along with technologies/servies only being discussed in the literature or still in the experimental stages. Hopefully, the paper will serve as a starting point for future thought on the subject.

In-House Services

Excess CPU and mass storage capacity would allow such internal applications as word processing, electronic mail/messaging, support of management decisions using PERT/CPM techniques and control of physical plant operation. Monetary savings, more efficient planning and operation and improved user services would probably result.

An "office of the future" technology that is available today is word processing. This technique, which can be done on machines "dedicated" to that purpose or with various-sized computers using the proper software, provides a flexibility of input and revision of material impossible to obtain with a typewriter. Word processing also allows limited text searching, often called "find and replace," in addition to sophisticated text editing and movement capacilities.

The clerical benefits of word processing technology in the production of letters, annual and other reports, forms, mailing lists, newsletters, user aides and so forth are

obvious. Coupled with on-line and network capabilities, controlled via excess CPU capacity, word processing would become more than just a super-secretary.

One author on the subject of word processors and libraries recommends a "shared-logic" system with several work stations, mass storage and printers controlled through a central processing unit. Such a configuration not only allows for easy addition of new work stations, but also the benefits of the central system such as file and system management and communication with compatible systems. (8)

Other possibilities can also be envisioned. Word processor terminals could access on-line acquisitions records to match with faculty member profiles for SDI purposes. (9) Terminals within main library and the various branches could be linked in one of several network topologies to facilitate communication among the various administrative personnel. Such a local network might also allow for easier cooperation in the creation of annual reports, user aides, etc.

The same word processing terminals could be used for additional purposes. Databases of interest to administrative personnel (names-and-numbers, reports-on-file and so forth) could be constructed and searched. The terminals would also allow for electronic messaging, datebooks and calendars for library personnel. Such a messaging system and its successful operation and benefits in a large research organization has recently been described. (10)

A second general internal service for which excess CPU

and mass storage capacity might be used is support of management decisions. A wide variety of mini- and microcomputer software is available that allows application of such techniques as Program Evaluation and Review Technique (PERT) and the Critical Path Method (CPM) as well as the electronic "spreadsheet" concept. These programs allow the manipulation of data concerned with the planning and scheduling of projects, research, budgets, etc. (11,12). Excess CPU and mass storage capacities would enable the adoption of such techniques on a large integrated scale.

These individual techniques might be incorporated into a decision support system (DSS) like that discussed by Chorba and Bommer. These authors describe a database that can be constructed to support such a DSS. "From this database reports may be retrieved to continuously monitor user needs, document availability, service utilization and user productivity. Such a reporting capability provides a means to identify problems and opportunities and to assess the consequences of management decisions." (13) The database mentioned could be adapted from the ones created as a result of automation in the case of the University of Alabama Library.

Electronic mail is a third category of in-house service that might be adapted to utilize excess capacity. The subject has received a great deal of attention in both the library literature and elsewhere. A recent article by Robert J. Veenstra discusses its application to the library environment.

He notes that the successful OCLC electronic mail system for interlibrary loans "is only the beginning. The next step points toward the transfer of short articles, papers, even chapters of books . . . (14)" To facilitate that next step, Veenstra proposes ILEM, the Interlibrary Electronic Mail Network. Such a network would facilitate the rapid transfer of both requests and short documents. Veenstra also notes, ". . . many libraries are developing computerized systems for automation which could be expanded to include ILEM." (15) Such an electronic mail system is only the prelude to long-distance access to on-line catalogs and a variety of other cooperative possibilities among libraries. Electronic mail would not have to be limited to interlibrary loan transactions; as long as the receiving party had the proper equipment, any sort of messages could be sent via the system. In this way the library could communicate instantly not only with distant libraries, but commercial firms, governmental units and individuals as necessary. The possibilities of electronic mail are exciting and serious discussion of them has begun. (16,17,18,19)

A fourth category of excess capacity use for in-house services is regulation of the physical plant's operation, or HVAC (heating, ventilation and air conditioning). Providing that the proper program could either be obtained or written locally, excess CPU capacity could be put to good use controlling the main library's temperature, lighting levels, and so forth.

This brief overview of possible internal uses of excess CPU capacity has touched a number of bases. The actual uses to which that capacity is put will be limited only by the imagination of library personnel.

Public Services

In terms of public services, a major application of excess CPU and storage capacity might be in support of reference. Such an application would hopefully create more depth and flexibility in that library function.

Surplus automation system capacity would allow the creation of numerous unique databases supportive of reference service. Library dependence on such on-line database vendors as Lockheed, SDC and BRS is growing rapidly, and recent popular literature estimates put the number of such databases in the 950 range, with "dozens (being) added every month." (20) Personal computers can access around ninety-five percent of those databases (21). However, the wisdom of this growth is already being questioned, and local database construction is underway.

One recent author notes, "The big excitement in the information business in this decade is going to be the evolution of local data bases. The same journal article now appears in four or five national data bases. How many more are needed?" (22) How many, indeed. Using excess capacity, a number of local database options would be open to the University of Alabama Library.

One such local database might consist of the reference collection titles in the main library and its branches. That base could be accessible initially by author(s), title and a key-words from titles subject approach. A file management program would make construction of this database relatively painless; after creation of the necessary fields and entry of the data, the base would be up and running. Future expansion might consist of additional access points such as tables of contents and even index entries for heavily used titles. A project at Iowa State University has laid the groundwork for this technique. (23,24)

A second possible local database might be an electronic version of the "Current Serial Titles and Locations" handbook. This database (along with others) could be on-line at the branch libraries in addition to the main building and offer serial call numbers as well as physical location. In this format the serials handbook would also be easier to update.

Excess CPU and mass storage capacity might lead to local databases that are currently non-existent or contained on index cards, etc. Community events calendars; directories of local public officials, organizations and services; and such campus databases as events and departmental, faculty and student phone numbers could be developed easily. Some of these types of databases might be interfaced with similar ones at the Tuscaloosa and Birmingham public libraries and elsewhere.

The presence of in-house computer technology would also lend itself to the construction of local and state newspaper indexes, verticalfile material catalogs and indexes, and bibliographies of local, state and regional publications both private and governmental. Much local information and publications are difficult to locate; current technology would allow at least some minimal control of that material. Once these databases are up, printed equivalents could be created for distribution or, in some cases, sale.

Yet another possible local database for reference support is the library's holdings of U.S. government depository publications. Public and staff access to individual titles is currently accomplished via a card catalog organized by Superintendent of Documents number. Instead of typing this information on cards, it could be keyboarded into electronic storage and retrieved by title, SuDocs number and perhaps key-words from titles.

Once the University of Alabama Library's automation system is in operation, reference department access to the on-line catalog, perhaps with status tags to indicate whether or not a title is checked out or missing, would seem to be a necessity. Future development in this area might include on-line access to the holdings of other state libraries, such as Birmingham Public, where automation has been accomplished.

An additional use of excess capacity might be the

development of tertiary databases specific to the needs of the local environment. A tremendous amount of material is already available via on-line databases; however, records for many subject areas are scattered across different databases. The development of tertiary databases poses difficult copyright and proprietary questions; yet the successful construction of the Women's Educational Equity Communications Network demonstrates that such problems are not insurmountable. (25) Tertiary databases would demand serious staff and resource commitments, but if projects are carefully chosen additional income from the sale of the final product might be a real possibility.

Finally, a useful database in reference departments would consist of frequent and difficult information requests with some sort of pointer tags to the answer or starting point. This database, accessible by subject, could be updated with new entries at set intervals (daily? weekly?) and available at the main library and its branches. The database might also be included on public access terminals. Such an on-line file might increase the productivity of reference librarians, alleviate patron waiting time and frustrations and aid new or substitute staff members.

A prototype of one such database, known as REFLES (Reference Librarian Enhancement System) has been developed at UCLA using a microcomputer and disk files. An early report on REFLES indicated that the system produced a more careful

review of sources used by reference librarians, served as a learning tool for student assistants and seemed to add structure and coherence to the reference interview. (26)

Closely related to this "ready-reference" data base, as well as other files previously discussed, are the online information and referral systems that have been created primarily in public libraries and private and public social service agencies. (27) These systems have been developed using both mini and microcomputer hardware and word processing and file management software.

Other types of reference files that might be electronically stored and made available online are policies and procedures of the reference and other departments; and information about library services, operations and other collections in the geographic area. (28)

Perhaps the most efficient use of excess CPU capacity in the area of reference files would be the system's ability to coordinate online access from local and remote terminals to one physical copy of each file. The overall use of excess CPU capacity in local networking will be discussed later in this paper.

A second broad category of public services that might be offered using excess CPU/mass storage are services available directly to patrons without library staff as intermediaries. One obvious possibility is public terminals to access the online catalog database. The Council on Library Resources is currently conducting an Online Public Access Catalog Evaluation

Project; preliminary results of the study were recently reported. (29) Survey respondents at public and academic libraries, as well as the Library of Congress, indicated they wanted a number of improvements, ranging from more terminals to more sophisticated subject access. Final results of the study are expected in September 1982 and should provide some guidance to the University of Alabama Library if public access terminals are provided.

Assuming that type of terminal becomes available, other services could be offered via a menu-driven system using the same hardware. Computer-assisted instruction might be used in the libraries to acclimate new patrons and introduce new services. CAI might also be used by new staff members. The library could consider offering community-calendars and similar files on the public terminals as well.

Another service available directly to faculty and students might be access to terminals and storage for the creation of databases, programs and so forth. Scheduling of this service might become a problem, although a nominal per-hour or half-hour fee would aid rationing to some extent.

Access to such information utilities as The Source and Compuserve might also be offered to patrons. These time-sharing systems, which carry services ranging from newspapers to financial news and games, are menu-driven and thus perhaps easier for beginners to operate than command-driven systems. Additional services include electronic mail, bulletin board

capabilities, and access to main-frame computer capacity. The non-prime time charges fall between five and six dollars an hour (30), but discounts might be available to high-volume users. The Source, at least, seems to be interested in library accounts. (31)

The Source and Compuserve are the sophisticated tip of a looming iceberg of services known generically as videotext and teletext. Activity is underway by newspaper chains (32), AT&T (33) and cable television stations like WTBS, based in Atlanta (34), to bring video- and teletext services directly to the home. The British videotext utility, Prestel, is already offered to microcomputer owners in the United States. (35) The availability of this service in the University of Alabama Library would not only introduce it to faculty, staff and students, but also provide an electronic version of a "browsing room."

As these interactive systems become more available and complex, the library and its users will devise more benefits. As Criner and Johnson-Hall have noted, "Videotext systems . . . should provide access to low-cost computing and network capability for specialized users or closed user groups . . ." (35) In other words, most of the services discussed in this paper can be derived from or applied to a videotext system. Once again, excess CPU capacity could be used to link and coordinate the nodes of this videotext network with other terminals/networks in the main library and its branches.

Network Services

Perhaps the most exciting use of excess CPU capacity would be to facilitate the construction of a local network. A 1979 compilation listed local library networks and cooperatives in twenty-nine states; however, these local networks do not necessarily have online interfaces among their members. (36) CPU capacity could be used to smoothly coordinate transactions among terminals within the main library, its branches, academic departments and dormitories. That network could then be connected to off-campus locations such as the Tuscaloosa and Birmingham public libraries, local governmental offices and other online networks. The services previously discussed could be routed via such a local network to and through as many notes as desirable.

The discussion of local networks has begun to appear, albeit almost as an afterthought, in the library literature. In 1978 Matthews noted the "shift away from older network designs based on functions distributed across a hierarchy of computers with the most powerful computer at the center. Instead, in more and more designs, computational functions are redundantly located throughout the network, and internodal traffic consists of data transactions. In effect, data sharing, not function sharing, is becoming the primary network rationale." (37) Raitt observes that in an LAN--Local Area Network--"very high speeds can be attained for data transfer and the network can be used for word processing applications . . . as well as

for electronic mail and packet transfer of messages between the connected work stations." (38)

Recent articles in popular computer journals explore specific topologies for local networks. (39) Such networks are usually decentralized, thus allowing for "full connectivity"---each work station in the network is capable of communicating with all other stations.

Two fully-connected topologies are the "bus" and "ring" systems. (See figures 1 and 2). "A bus network consists of a length of cable, called a bus, to which stations are attached by cable taps. Signals from one station branch out from the tap in both directions, thus reaching every other station in the network." (40) On the other hand, ring networks are "a circular chain of signal repeaters with cable links between each repeater. Network stations communicate by launcning messages into the ring via the repeaters, which relay the messages . . . to their destinations." (41)

Advantages of local networks include the ease of set-up, the lack of extensive hidden charges and few interface problems due to additional software requirements. (42) Local networks are available via commercial vendors or could be developed locally.

In the case of the University of Alabama Library's ELAS, a configuration of sub-setworks, controlled via CPU, might be developed. Such an arrangement is suggested in figure 3. This design is a variation of a star network

(figure 4); instead of being a single work station, each node is itself a local network and and sub-network of the ELAS.

This topology would have the advantage of most efficient use of excess CPU capabilities. The only demand on the CPU would be the routing of signals from one sub-network to another. Off-line storage, printing and intra-network data traffic could be handled without accessing the CPU. For instance, branch libraries could be equipped with a single terminal (or more if needs warrant), disk drive(s) and printer; nad via CPU at the main library access all other points in the ELAS network as well as directly access other branches through a sub-network for that purpose. With a minimum of resources each node in the sub-networks would have a maximum number of services available.

Some of the sub-networks might require their own, smaller, CPU. Assume that the public access terminals can perform several functions (online catalog, The Source, data-base and program creation/storage, etc.) through a menu-driven system. That sub-network might need a distinct CPU to co-ordinate all of its work stations. Such an arrangement could also be developed for other sub-systems, as required, and lessen further the demands on the central CPU.

Even though excess CPU would be devoted only to data routing, demands of the full ELAS might quickly outstrip the extra capability available. In order to allow for this probability, ELAS could be developed in discrete stages and, when necessary, an additional or larger CPU purchased.

Entrepreneurial Services

In recent years libraries have developed a greater dependence on various types of services offered to patrons at a fee. Within the past decade such fee-based services as photocopying, interlibrary loans and online database searching have become commonplace in libraries.

During the same period a sophisticated private sector fee-based information industry has sprouted. (43) These companies and individuals offer a wide variety of services ranging from simple fact location to SDI and document delivery. Thus these private sector firms are often competing with libraries in the kinds of services delivered to clients.

Extra CPU capacity in the University of Alabama Library's automation system might allow development of similar services to be offered either above and beyond normal services or to non-academic clientele. Extra capacity could be "sold" to academic departments and individual faculty and students or to local businesses. Self-services such as work processing might be offered at a per-hour rate via on-site or at-home terminals.

More sophisticated services using excess capacity might also be developed. In 1981 Lehigh University in Bethlehem, Pennsylvania, began offering fee-based services to the non-university community in the Lehigh Valley. In the first year five area companies enrolled as subscribers for such services as online literature searching, document

delivery, telefacsimile transmission, corporate borrowing privileges and SDI and reference services. The annual fee is $1000; sixty percent makes up the deposit account and forty percent the general benefits category. A per-transaction service is also available. In the first ten months of operation the project generated some $7000 income. Lehigh University's primary start-up cost was the half-time salary of the librarian who developed the service. (44)

The Lehigh University project might serve as a model for a similar service at the University of Alabama Library. The literature on private sector fee-based information services is now fairly extensive; many pitfalls in developing such a service could be avoided by a review of that literature. (46) This service could probably be initiated with minimal library resource investment.

## Conclusion

This paper has attempted to develop a "shopping list" of possible uses of excess CPU/mass storage capacity in the University of Alabama Library's automation system. I have also tried to outline a model that would allow smooth operation of a number of such uses simultaneously.

Electronic technology is developing at a breathless rate, and this paper has not included all such technologies from which services might be derived. Possible adaptations of videodiscs and cable television to library services are also appearing in the literature, and services built on their use

could be easily envisioned based on the outline I have suggested. Developments like bubble memory and fiber optics, which will allow much greater mass storage and communication capabilities, are on the horizon either in demonstration projects or serious developmental efforts. The future of electronic technology and its application in library services and procedures promises to be an exciting one.

Millard Johnson has recently attempted to couple electronic technology with a call for "active librarianship": ". . . for their own interest and that of their patrons, libraries must develop expertise as switching centers for electronic information."(46) But Johnson further notes, "The goal of active librarianship is to anticipate patrons' needs--to put the information in their hands before they realize they need it." (47) ". . . we should reject the idea that the place of the librarian is solely in the library. If librarians are the agents of their clients, their place is at the site of information needs." (48)

Electronic technology is such a powerful tool in librarianship that it allows librarians to reach the site of many information needs without ever leaving their seats. An Expanded Library Automation System at the University of Alabama Library would aid the library staff in reaching "the site of information needs."

BUS NETWORK

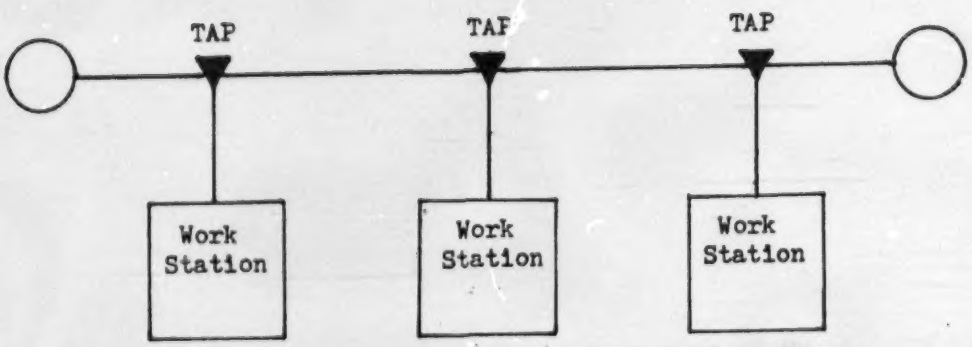


Figure 1

RING NETWORK

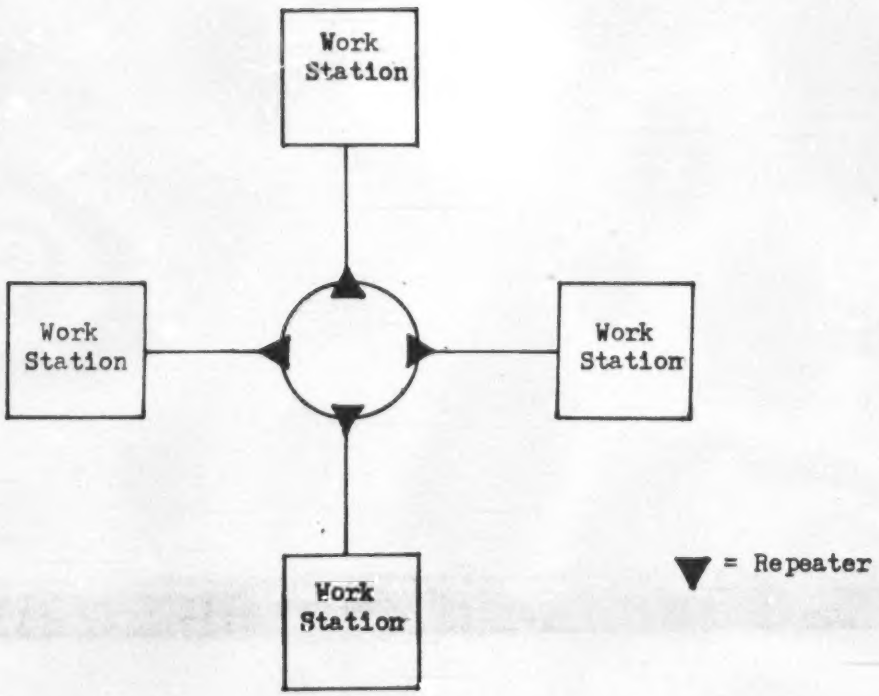


Figure 2

ELAS NETWORK

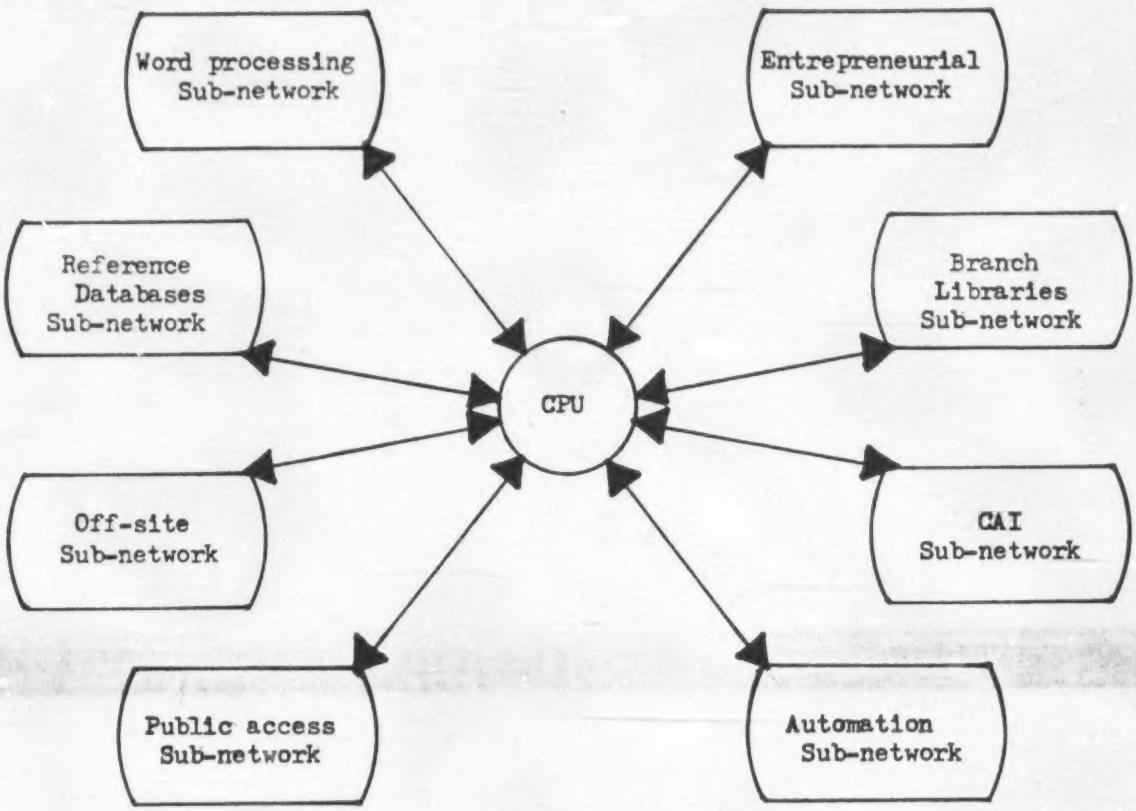


Figure 3

STAR NETWORK

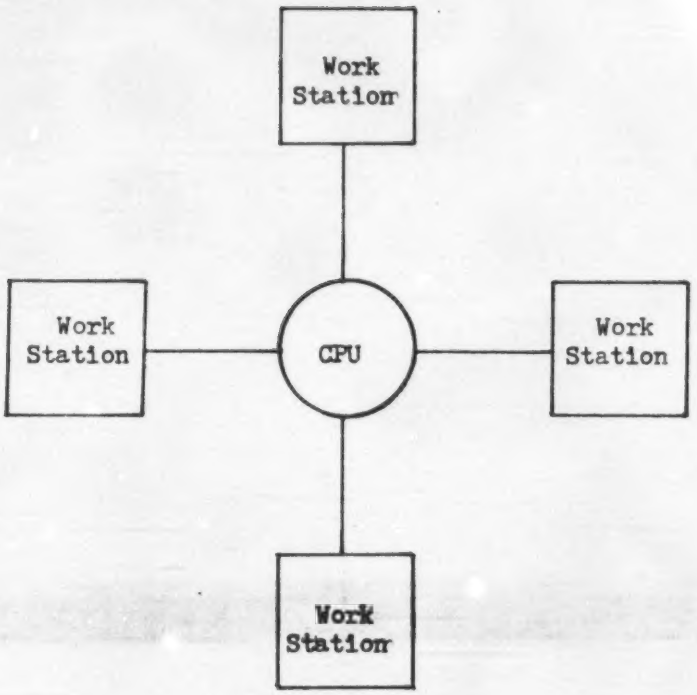


Figure 4

## FOOTNOTES

1. F. Wilfred Lancaster, "Whither Libraries? or, Wither Libraries?" College and Research Libraries, 1978; 39:345-57.

2. Michael Gorman, "The Electronic Library, or Learning to Cope with the Paperful Society." American Libraries, 1981; 12:273.

3. Kenneth E. Dowlin, "The Electronic Electric Library." Library Journal, 1980; 105:2265-70.

4. Susan Spaeth Cherry, "Electronic Library Association born at Columbus forum." American Libraries, 1981; 12:275-6.

5. Allen B. Veaner, "Major Decision Points in Library Automation." College and Research Libraries, 1970; 31:311-12.

6. Conversation with Dean D. Kaye Gapen, University of Alabama Library, January 29, 1982.

7. University of Alabama Library, "Computerized Online Academic Library System." Unpublished prospectus; October 8, 1981.

8. John Whitehead, "Word Processing: An Introduction and Appraisal." Journal of Documentation, 1980; 36:313-41.

9. J.B. Whitehead, "Developments in word processing systems and their application to information needs." Aslib Proceedings, 1980; 32:337.

10. Robert G. Rittenhouse, "Computer Based Messaging in a Research Organization" in Communicating Information, ASIS 43rd Annual Meeting, Proceedings (White Plains, NY: Knowledge Industry Publications, 1980), 17:38-40.

11. Michael Schuyler, "VisiCalc: Library Uses for a Business Standard." Access: Microcomputers in Libraries, 1982; 2(1):9,17-9,27.

12. Myron Berger, "Spreadsheets: Your Scenarios for Success." Personal Computing, 1982; 6(4):58, 61-3.

13. Ronald W. Chorba and Michael R.W. Bommer, "A Management Database for Decision Support in Academic Libraries" in Communicating Information, ASIS 43rd Annual Meeting, Proceedings (White Plains, NY: Knowledge Industry Publications, 1980), 17:303-5.

14. Robert J. Beenstra, "Electronic Mail has a Future in the Library." Special Libraries, 1981; 72:343.

15. Ibid., 344.

16. "Electronic Mail for Libraries in the West." Small Computers in Libraries, 1981; 9(9):6.

17. Helen B. Josephine, "Electronic Mail: The Future is Now." Online, 1980; 4(4):41-3.

18. Grant Birks, "Electronic Mail--Its Use in a Corporate Information Centre Network." in Communicating Information, ASIS 43rd Annual Meeting, Proceedings (White Plains, NY: Knowledge Industry Publications, 1980), 17:41-3.

19. Clifford A. Lynch, "Practical Electronic Mail Through a Centralized Computing Facility" in Communicating Information, ASIS 43rd Annual Meeting, Proceedings (White Plains, NY: Knowledge Industry Publications, 1980), 17:34-7.

20. Gerald Lanson, "Information, Please." Science 82, 1982; 3(2):38.

21. Jason Birmingham and Betsy Gilbert, "Computers Investigate that Research Rapidly, Reliably." Personal Computing, 1982; 6(2):46.

22. Paul G. Zurkowski, "The Library Context and the Information Context: Bridging the Theoretical Gap." Library Journal, 1981; 106:1383.

23. William H. Mischo, "Expanded Subject Access to Library Collections Using Computer-Assisted Indexing Techniques." Communicating Information. ASIS 43rd Annual Meeting, Proceedings. (White Plains, NY: Knowledge Industry Publications, 1980) 17:155-57.

24. William H. Mischo, "Expanded Subject Access to Reference Collection Materials." Journal of Library Automation, 1979; 12:338-54.

25. Matilda Butler and Ted Brandhorst, "Construction of a Tertiary Database: The Case of the Women's Educational Equity Communications Network" in Communicating Information. ASIS 43rd Annual Meeting, Proceedings (White Plains, NY: Knowledge Industry Publications, 1980), 17:174-76.

26. Kathleeen T. Bivings and Roger C. Palmer, "REFLES (Reference Librarian Enhancement System)" in Information Choices and Policies ASIS 42nd Annual Meeting, Proceedings (White Plains, NY: Knowledge Industry Publications, 1979), 16:58-65.

27. Emelie J. Shroder, "Online I&R in Your Library: The State of the Art." RQ, 1981; 21:128-34.

28. Karen L. Andrews, June Armstrong and Alan R. Benenfeld, "Microcomputers, Minicomputers, or Private Database Services in Reference Work: Some Decision Factors" in Communicating Information ASIS 43rd Annual Meeting, Proceedings (White Plans, NY: Knowledge Industry Publications, 1980), 17:310-13.

29. Larry Besant, "Early survey findings: Users of public online catalogs want sophisticated subject access." American Libraries, 1982; 14:160.

30. Stan Miatkowski, "Compuserve: A Potpurri of Information Services." Popular Computing, 1982; 1(5):74, 76, 78.

31. "'The Source' Aims at Libraries." Small Computers in Libraries, 1981; 1(9):6-7.

32. John Markoff, "News chain finalizes videotex agreement." InfoWorld, 1982; 4(6):1,5.

33. John Markoff, "What will a leaner Ma Bell do? AT&T's videotex plans." InfoWorld, 1982; 4(6):8-9.

34. John Teets, "The cat was away, but the video world never quit spinning." Birmingham (Alabama) News, April 13, 1982; 8C.

35. Kathleen Criner and Martha Johnson-Hall, "Videotex: Threat or Opportunity." Special Libraries, 1980; 71:384.

36. Brenda White, "Cooperatives and Networks: A Preliminary Survey and Suggested Sources of Information" in Markuson and Woolls, ed. Networks for Networkers: Critical Issues in Cooperative Library Development (New York: Neal-Schuman, 1980), 320-34.

37. William D. Matthews, "Advances in Electronic Technologies." Journal of Library Automation, 1978; 11:304.

38. D.I. Raitt, "Recent developments in telecommunications and their impact on information services." Aslib Proceedings, 1982; 34:68.

39. An example is Michael Swaine, "Local-Area Networks Primer." InfoWorld, 1982; 4(2):10-11.

40. Paul Kinnucan, "Local Networks Battle for Billion-Dollar Market." High Technology, 1981; Nov./Dec.:64.

41. Ibid., 65.

42. Mark Dahmke, "Local Networks Save Money, Increase Reliability." Popular Computing, 1982; 1(5):139.

43. For an overview see Richard W. Boss and Lorig Maranjian, Fee-Based Information Services: A Study of a Growing Industry (New York: Bowker, 1980).

44. Susan A. Cady and Berry G. Richards, "The One-Thousand-Dollar Alternative: How One University Structures a Fee-Based Information Service for Local Industry." American Libraries, 1982; 14:175-76.

45. See A.J. Wright, "No More Free Lunch: Private Sector Fee-Based Information Services---Past, Present, Future." Unpublished paper, 1982.

46. Millard F. Johnson, Jr. "After the online catalog: A call for active librarianship." American Libraries, 1982; 14:238.

47. Ibid.

48. Ibid., 239.

## ADDITIONAL REFERENCES


Ball, A.J.S. "Videotex Networks." Computer, 1980; 12(2):8-14.

Bloom, L.R., et al. Videotex Systems and Services. Washington, D.C.: Government Printing Office, 1980.

Bolton, W. Theodore, "A Lesson in Interactive Television Programming: The Home Book Club on QUBE." Journal of Library Automation, 1981; 14:103-108.

Corbin, John. Developing Computer-Based Library Systems. Phoenix, AZ: Oryz Press, 1981.

D'Urso, Lawrence A. "The Application of Microcomputers to New I&R Files: A Beginner's Experience." RQ, 1981; 21:146-55.

Emard, Jean-Paul. Information and Telecommunications: An Overview of Issues, Technologies and Applications. Washington, D.C.: Government Printing Office, 1981.

Genova, B.K.L. "Video and Cable: Emerging Forms of Library Service." Library Trends, 1979; 28:297-309.

Grosch, Audry N. Minicomputers in Libraries 1981-82. 2nd ed. White Plains, NY: Knowledge Industry Publications, 1981.

Jewell, John. "Automating I&R Files: World Processing, a First Step." RQ, 1981; 21:135-40.

King, Donald W., et al. Telecommunications and Libraries: A Primer for Librarians and Information Managers. White Plains, NY: Knowledge Industry Publications, 1981.

Landau, Robert M. "The Impact of Office Automation on Libraries." Special Libraries, 1981; 72:122-26.

Light, Jane Irby and Yamamoto, Carol. "An Online Information and Referral File: Peninsula Library System's Community Information Program." RQ, 1981; 21:146-55.

Liu, R. "Telelibrary---Library Services via Satellite." Special Libraries, 1979; 70:363-72.

Logue, T.J. "Teletext: Towards an Information Utility." Journal of Communications, 1979 August; 29:58-65.

Plakias, Mark. "New Electronic Media: The Future and Co-operation." RQ, 1980; 20:66-9.

Pratt, Allen D. "The use of microcomputers in libraries." Journal of Library Automation, 1980; 13:7-17.

Rorvig, Mark E. Microcomputers and Libraries: A Guide to Technology Products and Applications. White Plains, NY: Knowledge Industry Publications, 1981.

Rowat, M.J. "Microcomputers in libraries and information departments." Aslib Proceedings, 1982; 34:26-37.

Sigel, Efrem, ed. Videotext: The Coming Revolution in Home/Office Information Retrieval. White Plains, NY: Knowledge Industry Publications, 1980.

Slater, Cynthia. "Automated Information and Referral at Pikes Peak Library." RQ, 1981; 21:140-3.

Sneed, Charles. "The Videodisc Revolution: What's Ahead for Libraries." Wilson Library Bulletin, 1980; 55:186-9, 238.

"Video Disks and Micros." Small Computers in Libraries, 1982; 2(2):1.

Wiest, Jerome D. and Levy, Ferdinand K. A Management Guide to PERT/CPM. Englewood Cliffs, NJ: Prentice Hall, 1969.

Wohl, Amy D. "Replacing the pad and pencil." Datamation, 1980; 26(6): 169-76.

Wollman, Jane. "Coin-Operated Computers." Popular Computing, 1982; 1(6):141-3.

Wood, R. Kent and Woolley, Robert D. An Overview of Videodisc Technology and Some Potential Applications in the Library, Information and Instructional Sciences. Syracuse, NY: Syracuse University Printing Services, 1982.

"Word-Processing Software Directory." Popular Computing, 1982; 1(4):22-4, 26, 28, 30.